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Currency-banking crises and economic downturns: A comparison between Islamic and conventional banks

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Abstract - This paper examines the effects of currency and the banking crises on economic downturns in North Africa and GCC countries based on a Financial Stress Index (FSI). The paper identifies episodes of financial turmoil according to FSI values and proposes an analytical framework to assess the impact of financial stress – in particular the effect of Islamic banks distress and conventional banks distress – on the economic downturn. It concludes that financial turmoil characterized by banking distress is more likely to be associated with severe and protracted downturns than stress mainly in securities or foreign exchange markets. Furthermore, the contribution of Islamic banks in the FSI is – against all odds – no less important compared to conventional banks in the financial system mainly during the last world financial crisis.

Keywords: Banking crisis, Early warning Indicators, Financial Stress, Economic downturns

1. Introduction

The last round of global financial turmoil has prompted policy makers and economists around the world to pay closer attention to the linkages between financial system risks and economic activity. Against this situation, many countries have developed some Financial Stress Indexes to monitor the risks in the financial systems and to gain a deeper understanding of the causes and consequences of these risks. Hence, the recent financial crisis and the associated decline in economic activity have raised some important questions about economic dynamics and links to the financial sector.

This paper studies the relationship between currency and banking crises and economic downturns in the region of North Africa and GCC countries by introducing a synthetic index of financial stress to monitor the financial vulnerabilities and crisis and shows how stress interacts with economic activity. We examine a variety of questions including mainly the implications of financial stress for the economic dynamics in the considered regions and the implications of shocks to the economic dynamics for financial stress. The analyses encompass two classes of banks – Islamic banks and conventional banks – in order to give an answer to the following question: are Islamic banks more resistant to financial crisis?

Also, we specifically estimate a parameterized multivariate and a time-varying transition probability Markov-switching model in order to evaluate the probability of observing a future crisis given the information contained in the set of financial variables.

We extend the existing literature on studying financial shocks and vulnerabilities in the following ways: First, we identify past systemic events by using a synthetic financial stress index measuring the level of systemic tensions in the financial system of a country. Second, in predicting the identified systemic events, we evaluate the joint role of Islamic and conventional banks. This strategy encompasses traditional approaches that look only at the role of banking sector and its influence on financial instability.

By doing so, this paper tries to clear up the following main questions: Do banking crises and economic downturns have symmetric effects? Do financial vulnerabilities have an impact on the economic activity in the North Africa countries and GCC countries? Does monetary policy have the same effect on the economic dynamics in the low financial stress regime and in the high financial stress regime? Could we consider the financial stress index as an efficient approach to predict the financial crises?

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This paper is organized as follows: in the first section, a literature review of currency and banking crisis diagnostics based on a financial stress index is presented. The second section describes main differences between Islamic banking and conventional banking. Section 3 deals with Islamic banking in MENA countries and its evolution. Sections 4 and 5 are devoted to Financial Stress Index descriptions and economic downturns. The time-varying transition probability Markov-Switching model used in financial stress estimation is presented in sections 6 and 7. Some principal results and policy implications are discussed in sections 8 and 9.

2. Literature on currency-banking crises and financial stress

Many empirical studies of financial stability focus on selecting early warning systems of crises, but most use simple definitions of the crises themselves. Typically, crises are identified with binary variables based on extreme values of a dummy financial variable. This section describes briefly the variables used in the literature to define a crisis.

Banking crises

Because of the lack of suitable data and institutional differences across countries, it can be challenging to define a banking crisis; the analysis relies mostly on qualitative information. Many studies avoid defining banking crises and rely on judgment. For example, Kaminsky and Reinhart (1996) and Logan (2000) define banking crises on an ad-hoc basis as a combination of country-specific events. But a few studies have addressed the issue directly. Examples include Bordo (2000), who defines a banking crisis as a situation where actual or incipient bank runs or failures lead banks to suspend the internal convertibility of their liabilities. Caprio and Kilingebiel (1996) define a systemic banking crisis as an instance in which bank failures or suspensions lead to the exhaustion of much or all bank capital.

More recent papers combine this qualitative approach with a limited number of quantitative criteria. For example, Demirgug-Kunt and Detragiache (1998) define a banking crisis as a situation where at least one of the following conditions holds: (i) the ratio of non-performing assets to total assets is greater than 10 per cent, (ii) the cost of the rescue operation is at least two per cent of GDP, (iii) banking problems result in the large-scale nationalization of banks, and (iv) extensive bank runs leading to emergency measures.

Certainly, a more quantitative method of identifying a banking crisis involves the use of aggregate balance sheet data. The literature frequently uses three measures to identify bank balance-sheet problems: (i) the stock of non-performing loans as a percentage of total assets (Corsetti, Pesenti, and Roubini, 1998; Gonzalez-Hermosillo, 1999), (ii) bank deposits as a percentage of GDP (Hardy and Pazarbasioglu, 1998), and (iii) lending as a percentage of GDP (Hardy and Pazarbasioglu, 1998; Sachs, Tornell, and Velasco, 1996).

Currency crises

Currency or foreign exchange crises are usually defined as significant devaluations, losses in reserves, and/or defensive interest rate increases. Frankel and Rose (1996) define a currency crisis as a nominal depreciation of at least 25 per cent that exceeds the previous year's change by a margin of at least 10 percentage points. To take into account the possibility of government intervention in case of a speculative attack, Kaminsky, Lizondo, and Reinhart (1998) and Caramazza, Ricci, and Salgado (2000) take a weighted average of exchange rate changes and reserve losses, then the crisis threshold is defined in terms of standard deviations from the mean. Corsetti, Pesenti, and Roubini (1998) use a similar measure, but employ multiple thresholds to achieve a graded index. Eichengreen, Rose, and Wyplosz (1995) and Hawkins and Klau (2000) include hikes in interest rates to reflect government intervention intended to avert a crisis.

These approaches, which essentially connect stress with volatility measures, have been criticized because they ignore potentially important information about the stochastic process that generates exchange rates (Sauer and Bohara, 2001). The proposed solution has been to use autoregressive conditional heteroscedastic (ARCH) or general ARCH (GARCH) models, in the Engle (1982) and Bollerslev (1986) traditions, respectively, to analyze exchange rate volatility, because those models can take into account skewed distributions.

3. Islamic banking and conventional banking

Like conventional banks, Islamic banks are intermediaries and trustees of the money of other people; the difference is that they share profit and loss with their depositors. This difference is introduced in Islamic banking: depositors are customers with some ownership rights (Dar and Presley, 2000).

As shown in Table 1, Islamic banking and conventional banking differs in that while conventional banking follows conventional interest-based principle, Islamic banking is based on interest-free principles and principles of profit-and-loss (PLS) sharing in performing their businesses as intermediaries (Bashir, 2000). The rationale behind prohibition of interest and the importance of PLS in Islamic banking has been discussed in many Islamic economics studies. Moreover, Islamic PLS principle creates the relationship of financial trust and partnership between borrower, lender, and intermediary (Yudistira, 2003).

According to Bashir (2000), Islamic banks compared with non-Islamic banks seek a just and equitable distribution of resources. Islamic banks are based on Islamic *faith* and their operations must be within the boundaries of Islamic Law or *Shariah*. There are four rules that govern investment behavior (Suleiman 2001):

1. Absence of interest-based (Riba) transactions
2. Avoidance of economic activities involving speculation (Gharar)
3. Introduction of an Islamic tax (Zakat)
4. Discouragement of the production of goods and services, which contradict the value pattern of Islam (Haram)

Table 1. Major differences between conventional banks and Islamic banks.

Characteristics	Islamic banking system	Conventional banking system
Business Framework	Based on Shariah laws – Shariah scholars ensure adherence to Islamic laws and provide guidance.	Not based on religious laws or guidelines – only secular banking laws.
Balance Between Moral and Material Requirement	The requirement to finance physical assets which banks usually take ownership of before resale reduces over extension of credit.	Excessive use of credit and debt financing can lead to financial problems.
Equity Financing with Risk to Capital	Available. Enables several parties, including the Islamic Bank, to provide equity capital to a project or venture. Losses are shared on the basis of equity participation while profits are shared on a pre–agreed ratio. Management of the enterprise can be in one of several forms depending on whether the financing is through Mudaraba, Musharaka, etc.	Not generally available through commercial banks, but through venture capital companies and investment banks, which typically take equity stakes and management control of an enterprise for providing start–up finance.
Penalty/Late Payment	Penalties on late payments are prohibited. If penalties are levied, they must be re–channeled to charities.	Fees are typically charged for late payments.
Ethical Transaction	Transactions and activities that involve engagement with unlawful business sectors such as gambling and brewery are not allowed.	Besides money laundering and the financing of criminal activities, how customers utilized borrowed funds is typically unrestricted.

Source: Blominvest Bank http://www.blominvestbank.com/

4. Islamic banking in the Mena region

GCC countries

Islamic Banking has been growing worldwide significantly in the past three decades and is developing remarkably in Southeast Asia, the Middle East, and even in Europe and North America. GCC countries have dual banking system where Islamic and conventional banks are operating side by side (Figures 1, 2).

Bahrain has eased entry barriers for new Islamic banks. Currently, there are 6 Islamic retail banks and 20 Islamic wholesale banks in the country, resulting in the highest concentration of Islamic financial institutions in the Middle East. The regulatory framework is well-developed and reasonably transparent. The Prudential Information and Regulatory Framework is the first framework especially designed for Islamic finance and provides a good platform for overall governance (Rodney W, 2009).

In Kuwait, the number of Islamic banks that can operate in the country is limited. Currently, there are three licensed institutions, all of which used to be public. Islamic windows run by conventional banks are not allowed. Thus, new entries into the market seem unlikely unless there is a change in regulations. In addition to that, Kuwait is not granting any new licenses. Therefore, the conversion of the Commercial Bank of Kuwait into a fully Islamic bank, announced in early 2008, is still not complete.

Oman does not have an Islamic banking sector as it does not allow Shariah-compliant financial institutions, and the situation doesn't appear to be changing in the near future. The idea behind this trend is that all banks should be international and not deal with specific operations and regulations (Blominvest Bank Annual Report, 2009).

Qatar opted for an initial period of license restriction to test the Islamic banking concept with only two banks allowed until 2006. Since then however, as restrictions have been eased, the market has developed manifold and today almost 10 banks offer Shariah-compliant products. In 2005, the government established the Qatar Financial Center (QFC) to attract financial institutions and capital into the country. QFC regulations are liberal and allow a relatively quick and easy establishment of Islamic wholesale financial institutions.

Development of Islamic banking in Saudi Arabia is hampered by the lack of clear laws, and technically

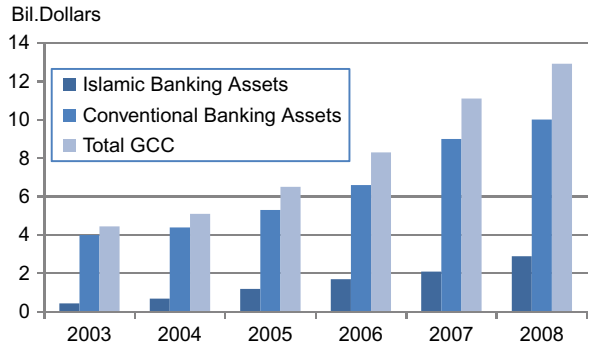

Figure 1. Breakdown of banking assets in GCC. *Source*: Annual review of Islamic banking and finance (2010).

Shariah-compliant finance is against the constitution. In practice however, Islamic finance institutions are present in the market, but they operate in a challenging environment with many discretionary licensing conditions and are subject to strong government influence. This directly reflects on the fact that only 4 out of 14 banks have been opened since 2000. Nevertheless, Saudi Arabia remains one of the GCC countries where Islamic finance is increasing constantly.

The UAE market is relatively competitive, with a large number of banks serving a limited population. Additionally, in 2004, the Dubai International Financial Center (DIFC) was established with the objective of making UAE one of the major global onshore financial hubs. To this end, a lot of incentives were introduced, most importantly a much more liberal business environment than in the rest of the country, especially in terms of foreign ownership. In spite of retail banking being excluded from DIFC regulations, a number of international institutions (such as HSBC Amanah or Citibank) have established operations there.

North African countries and Turkey[1]

After years of watching from the sidelines, North Africa has begun to embrace Islamic finance as banking develops and governments try to channel more Arab countries into an investment-starved region. But growth could be far slower than in the GCC countries given resistance from some political and business elites (Blominvest Bank Annual Report, 2009).

In Tunisia, there is only one Islamic bank, the Bank BEST (Beit Ettamouil Essaoudi Ettounsi Bank). It was created in 1983, but remains restricted to local institutional as well as large investors, especially those in the Gulf. The Tunisian authorities have indeed avoided, until now, making Islamic products accessible to ordinary citizens, presumably for political reasons.

In Morocco, the Islamic banking products (officially called alternative) have entered the capital market on first October, with the approval of the ruling Justice and Development Party (PJD, a moderate Islamist party). The government hopes to bring in the banks of many Moroccans who settle their transactions in cash. Only 20% of the population uses a bank account. Attracting capital from investors in the Gulf is another issue. Morocco now allows conventional banks to offer Ijara leasing products, Murabaha contracts to buy and re-sell an underlying goods and Musharaka co-ownership financing structures.

Neither Algeria nor Libya has fully authorized Islamic finance, but Algeria already permits two players. Saudi-controlled Banque Albaraka d'Algerie has become one of the country's most successful private banks by offering more sophisticated products and better customer service than bigger public sector lenders.

In Egypt, out of 7 banks with Islamic operations, only one has been established since 2000, reflecting the reluctance of institutions to enter this market. While Islamic windows are operational in 5 banks, a lack of adequate regulation impedes the overall growth of Shariah-compliant finance.

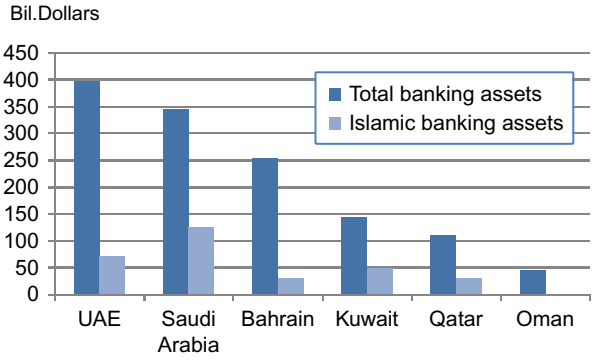

Figure 2. Market penetration of Islamic banking in GCC. *Source*: Annual review of Islamic banking and finance (2010).

The Islamic financial institutions market (Participation Banks) has grown considerably, especially since 2001 (when Turkey experienced its last economic crisis), at an average annual rate of 40% in terms of asset size, 53% in terms of funds placed and 40% in terms of funds raised (Islamic Finance News Guide, 2010). Four participation banks are currently operational in Turkey: al Baraka, Bank Asya, Kuveyt Türk, and Türkiye Finans. Like mainstream financial institutions, these banks offer a wide range of services, including savings and checking accounts, house and automobile financing, and even Islamic bonds, or *Sukuk*.

5. Measuring financial stress

Conceptualizing the financial stress index

In this paper, the FSI for each country is constructed as a variance-weighted average of three sub-indices, which can be thought of as being associated with the banking, securities, and foreign exchange markets (Balakrishnan *et al*., 2009). There are many other potential candidates for inclusion in the FSI, but given the cross-country nature of this study, one objective was to use a uniform set of time series across all 10 countries. Another objective was to use a minimum set of time series that would signal financial stress episodes. Adding tends to be restricted owing to data availability, both across time and country dimensions. It could also potentially contaminate the FSI with noisy indicators (Cardarelli *et al.,* 2010).

The advantage of utilizing such an index is its ability to identify the beginning and peaks of financial stress episodes more precisely, that is, the specific quarter of a year when an episode can be said to have begun, and its duration. Moreover, constructing such an index facilitates the identification of four fundamental characteristics of financial stress events: the exchange market pressure index, sovereign debt spreads, beta banking sector, stock market returns and, finally, stock volatility. Looking at these sub-components can help identify which types of financial stress (banking related, securities market related, currency related, or a combination of these) have been associated with larger output consequences (Cardarelli *et al.,* 2010).

This section follows Balakrishnan *et al*. (2009) work in describing the components and methodology used to

construct the FSI for considered countries. Each component is de-meaned and normalized by its standard deviation, and then added together to construct the index. Normalizing each component by its standard deviation is necessary to ensure that the overall index is not dominated by large fluctuations in one component. The additive feature of the index allows for a straightforward decomposition into contributions of each component (Moriyama, 2010; Cardarelli *et al.,* 2010).

Episodes of financial stress are identified as those periods when the index for a country is more than one standard deviation above its trend. The FSI is given by the sum of the five components: the EMPI, sovereign spreads, the beta-banking sector, stock returns, and time-varying stock return volatility:

$$FSI = EMPI + Sovereign\ spreads + \beta\text{-}banking\ sector + Stock\ returns + Stock\ volatility \quad (1)$$

Variables description:

An ***EMPI*** increases as exchange rate depreciates or as international reserves decline, where the *EMPI* for month *t* is given by the following formula:

$$EMPI_t = \frac{\Delta e_t - \mu_{\Delta e}}{\sigma_{\Delta e}} - \frac{\left(\Delta RES_t - \mu_{\Delta RES}\right)}{\sigma_{\Delta RES}} \quad (2)$$

Δe and ΔRES are the month-over-month percent changes in the nominal exchange rate vis-à-vis an anchor currency (for example, US dollar or Euro) and total reserves minus gold, respectively. μ and σ denote the mean and standard deviation of the relevant series, respectively, over the sample period.

Sovereign spreads indicates increased (external) default risk of a country defined as the bond yield minus the 10-year United States Treasury yield using JP Morgan EMBI Global spreads.[2] When EMBI data were not available, five-year credit default swap spreads were used.

The ***β-banking sector*** is derived from the standard capital asset pricing model (CAPM[3]):

$$\beta_t = \frac{Cov\left(r_t^M, r_t^B\right)}{\sigma_M^2} \quad (3)$$

r represents the year-over-year banking or market returns, computed over a 12-month rolling window. If $\beta > 1$ then banking sector stocks are moving more than proportionately with the overall stock market suggesting that the banking sector is relatively risky and is associated with a higher likelihood of a banking crisis.

Stock returns are a proxy to capture that falling equity prices that correspond to increased market stress, where the returns are the month-over-month real change in the stock index multiplied by –1, so that a decline in equity prices corresponds to increased securities market related stress.

Stock volatility represents financial uncertainty. Higher volatility captures heightened uncertainty in an economy, derived from a GARCH specification, using month-over-month real returns modeled as an autoregressive process with 12 lags (Moriyama, 2010; Balakrishnan *et al*. 2009).

Given the availability of data, we consider quarterly data from 2001 to 2010. This period includes years of financial crises in late 2000 and early 2001 (Turkish currency crisis) as well as the 2007/2008 subprime crisis. The FSI results are shown in figures 3 and 4 for North African countries, Turkey and GCC countries, respectively.

On the whole, it seems that the GCC countries were more resistant to currency and banking crisis than North African countries and Turkey, especially during the last world financial crisis. More presented data about GDP growth in the next sections confirm this result.

Episodes of financial stress

By considering episodes of financial stress, we are trying to decompose the sample data into two sets: periods leading to a crisis (crisis), and periods characterized by relative financial stability (tranquil times) in terms of the degree of fragility of the economy.

Using the five sub-components described above, the FSI is constructed for each of the 10 countries in the sample. Episodes of financial stress are identified as those periods when the index for a country is more than one standard deviation above its trend (Cardarelli *et al.,* 2010). These episodes signal that one or more of the banking, securities,

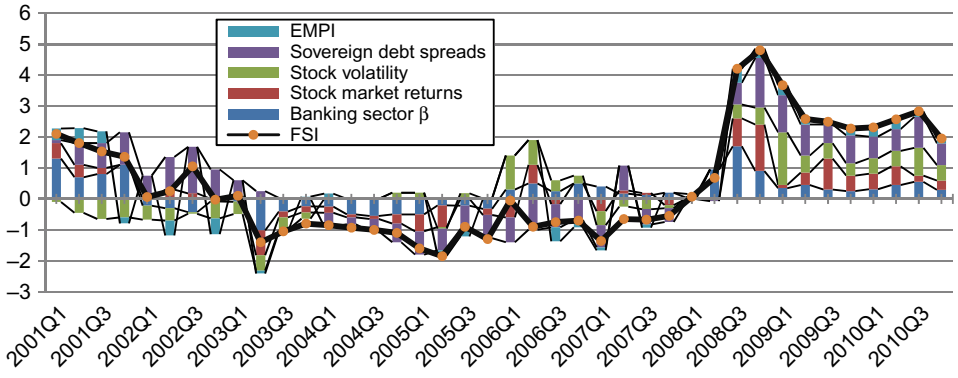

Figure 3. Financial stress in NA-T countries.

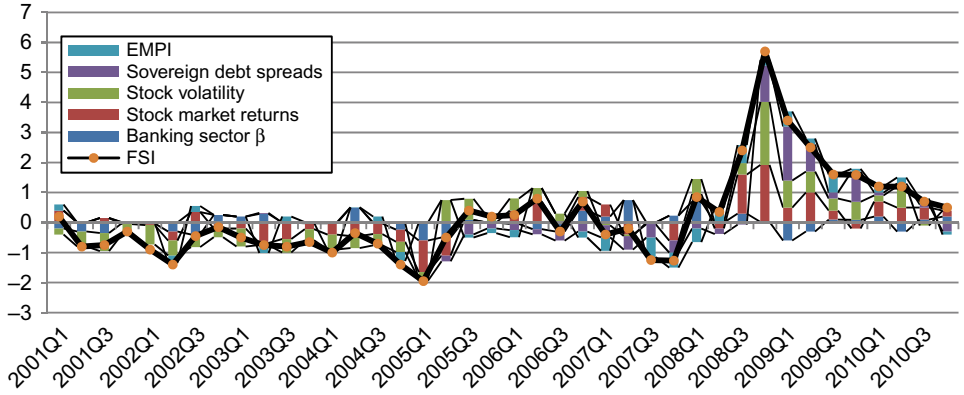

Figure 4. Financial stress in GCC countries.

and/or foreign exchange market sub-components has shifted abruptly. Also, episodes with more than 1.5 standard deviations above its trend are considered high financial stress episodes.

Looking at the overall sample data, we have identified 23 financial stress episodes for North Africa countries and Turkey (NA-T) and only 14 financial stress episodes for the GCC countries (Table 2). Of these episodes, 22 were considered financial crises with a high FSI (15 for NA-T and 7 for the GCC). Most of the financial stress episodes are driven by stress in the banking sector (the banking variables accounted for the majority of the increases of the FSI during these episodes).

For the global financial crisis, the FSI indicates that the financial crisis has a significant global dimension, affecting virtually all countries in the sample (Figure 3 and Figure 4). In addition, the FSI has accurately determined the 2000–2001Turkish crisis. Overall, the index appears to capture extreme financial episodes accurately.

The FSI also accurately captures the fact that while the origins of the current episode were in the banking sector, by early 2008 the crises had become much more broad based, affecting banking, securities and foreign exchange markets at the same time (Figure 3 and 4).

Overall, these results suggest that the FSI can be considered a comprehensive indicator that successfully identifies the main episodes of financial stress for the sample of countries under consideration and can provide the basis for an examination of the macroeconomic consequences of such stress.

6. Financial stress and economic downturns

Economic downturn cycles

Having identified episodes of financial stress, a first question of interest is: How many of these episodes were followed by an economic downturn? Were economic downturns preceded by episodes of financial stress different from those that were not?

To answer these questions we have used the following definitions of economic downturns: *An episode of financial stress is followed by an economic slowdown if the level of real GDP falls below trend (identified using the Hodrick-Prescott filter for Trend-Cycle Decompositions) within six quarters of the onset of the financial stress episode (Hodrick and Prescott, 1997)*.

Hodrick-Prescott filter

Trend-cycle decompositions are routine in modern macroeconomics. The basic idea is to decompose the economic series of interest (for example the log of GDP) into the sum of a slowly-evolving secular trend and a transitory deviation from it which is classified as *cycle*:

Table 2. Financial stress episodes.

	North Africa countries and Turkey	Gulf cooperation council countries	Total
Banking Crisis	18	10	28
Foreign Exchange	5	4	9
High FSI	15	7	22
Low FSI	8	7	15
Total Financial Stress Episodes	**23**	**14**	**37**

Table 3. Financial stress episodes and economic downturns.*

	North Africa countries and Turkey	Gulf cooperation council countries	Total
FSI Followed by Economic Downturn	8	4	12
FSI Not-Followed by Economic Downturn	15	10	25
Total Financial Stress Episodes	**23**	**14**	**37**

*Downturn: number of quarters where GDP is below the Hodrick-Prescott trend.

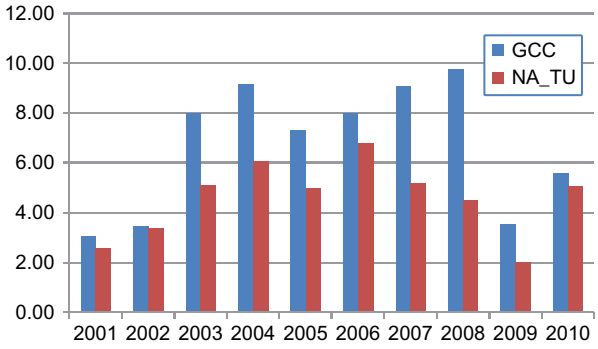

Figure 5. GDP growth rate in NA-TU & GCC (Annual %).

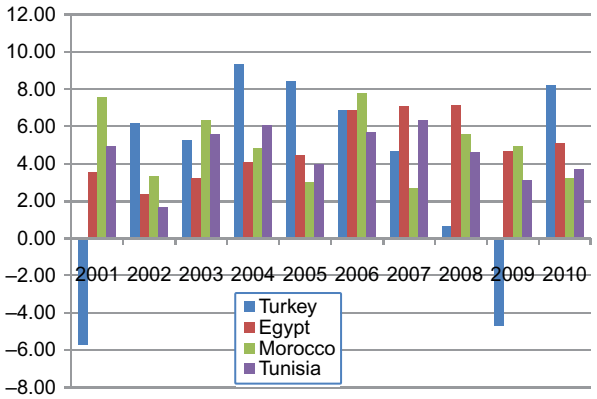

Figure 8. GDP growth rate in NA-T countries (Annual %).

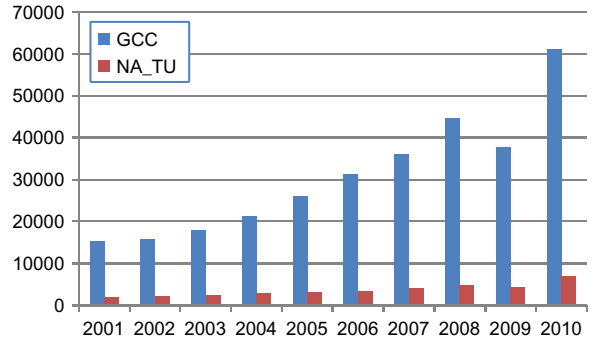

Figure 6. GDP per capita in NA-TU & GCC countries (USD).

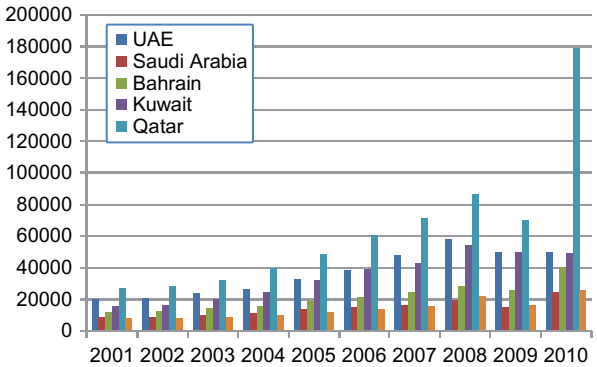

Figure 9. GDP per capita in GCC countries (USD).

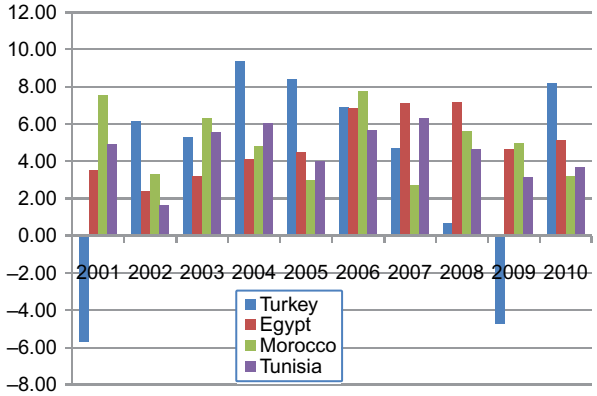

Figure 7. GDP growth rate in GCC countries (Annual %).

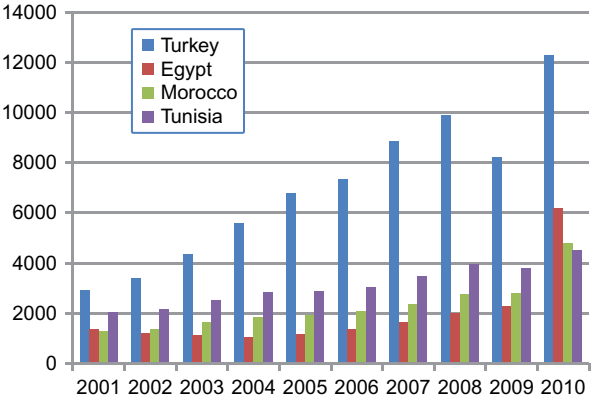

Figure 10. GDP per capita in NA-T countries (USD).

Source: World bank, OCED satistics & CIA World Factbook.

$$x_t = \tau_t + \xi_t$$
$$Observed\,Series = Permanent\,Trend + Cycle \qquad (4)$$

However, as these constituent parts (trend and cycle) are not readily observed, any decomposition must necessarily be built on a conceptual artifact. Thus, any trending method, must start out by somehow arbitrarily defining what shall be counted as *trend* and as *cycle,* before these elements can be estimated from the data.

The most common method used to extract the trend from a time series is the Hodrick-Prescott (HP) filter (Hodrick and Prescott, 1997). The HP filter extracts the trend τ_t by solving the following standard-penalty program:

$$\min_{\{\tau_t\}} \sum_{t=1}^{T} (x_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} \left[(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1}) \right]^2 \qquad (5)$$

- $\min_{\tau_t} \sum_{t=1}^{T} (x_t - \tau_t)^2$ is the Goodness of Fit
- $\lambda \sum_{t=2}^{T-1} \left[(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1}) \right]^2$ is the Penalty for Roughness

Where the smoothing parameter λ controls the smoothness of the adjusted trend series, $\hat{\tau}_t$, as $\lambda \to 0$, the trend approximates the actual series, x_t, while as $\lambda \to \infty$ the trend becomes linear.

While Hodrick and Prescott (1997) suggest values for λ, Marcet and Ravn (2003) recast the formula (5) as a constrained minimization program to determine the value of λ endogenously. For annual data, λ should be between 6 and 7, (Ravn and Uhlig, 2002; Maravall, 2004). Note that the HP formula (5) can be written more succinctly as[4]:

$$\min_{\{\tau_t\}} \sum_{t=1}^{T} \xi_t^2 + \lambda \sum_{t=3}^{T} \left(\nabla^2 \tau_t \right)^2 \qquad (6)$$

Which indicates that the HP filter attempts to maximize the fit of the trend to the series (i.e., minimize the cycle component in (4)) while minimizing the changes in the trend's slope.

Based upon these definitions, of the 37 financial stress episodes, 12 (8 + 4) were followed by an economic downturn. The remaining 25 financial stress episodes were not followed by an economic downturn. (Table 3, Figures 5 & 6). The eight FSI episodes followed by an economic downturn correspond to the periods: 2001Q1, 2001Q2, 2001Q3, 2005Q1, 2005Q2, 2008Q4, 2009Q1 and 2009Q2. For the GCC countries, the four periods corresponding to economic downturns are: 2008Q3, 2008Q4, 2009Q1 and 2009Q2. On the whole, all these downturn periods are recorded in the peak periods of the last world financial turmoil, mainly for the GCC countries; the difference for North Africa countries and Turkey remain fundamentally characterized by the Turkish financial crisis (2000–2001). Because of the sharp decline in oil prices since mid-2008, GCC countries have experienced a significantly lower economic growth in 2009 than the previous year, with the exception of Qatar.

In particular, when preceded by financial stress, economic slowdowns tend to be characterized by a flattening in consumption growth. More detailed conclusions are presented in the discussion section.

7. Markov-switching time-varying transition probabilities

We consider a two-state Markov switching autoregressive model for the FSI. Both states, also called regimes, are intended to discriminate between periods of *low financial stress* and *high financial stress*. The regimes are not pre-selected (as would be the case if we were using a 0–1 dummy variable). Instead, we let the model say whether at a given time *t* the FSI index is considered to evolve in a low financial stress or high financial stress regime, owing to the fact that the likelihood of being in either regime is governed by a latent unobservable two-state Markov chain variable. The formalization below follows Filardo and Gordon (1998), Laton and Smith (2007) and Kim *et al.* (2010).

Suppose that y_t is the FSI index observed at time t = 1, 2, ..., *T*. Its dynamics is given by the following equation:

$$y_t = \mu(s_t) + \varnothing(s_t) y_{t-1} + \sigma\varepsilon_t \qquad \varepsilon_t \sim N(0,1) \qquad (7)$$

$s_t = \{0,1\}$ is a latent variable and: $\mu(s_t) = \mu_1 + \mu_2 s_t$, with $\varnothing(s_t) = \varnothing_1 + \varnothing_2 s_t$, $\mu(s_t)$ and $\varnothing(s_t)$ indicate that the average value of FSI and its autoregressive dynamics is regime-dependent. Equation (7) can be generalized in order to include higher lags and a state-dependent residual standard error.

Since s_t is assumed to follow a Markov-chain, the realization of each state is assigned a probability and the transition probability matrix is written as follows:

$$P(s_t = i / s_{t-1} = j, L_t) = \begin{bmatrix} p(L_t) & 1 - p(L_t) \\ 1 - q(L_t) & q(L_t) \end{bmatrix}, \quad i, j = 1,2 \qquad (8)$$

Where $L_t = \{L_t, L_{t-1}, ...\}$ is the history of the leading indicator of the Financial Stress Index (currency and/or banking crisis). This formalization assumes that a country's currency and/or banking crisis is informative with regard to the likelihood of a higher or a lower financial stress.

The functional form of the functions $p(L)$ and $q(L)$ is assumed to be sigmoid and to map the leading indicator values into the [0,1] interval (logistic, Gaussian, Cauchy distributions). We assume here a logistic function, as is common wisdom in the empirical literature using this class of models:

$$p(L_t) = \frac{\exp(\theta_0^p + \sum_{m=1}^{M} \theta_m^p L_{t-m})}{1 + \exp(\theta_0^p + \sum_{m=1}^{M} \theta_m^p L_{t-m})},$$
$$q(L_t) = \frac{\exp(\theta_0^q + \sum_{m=1}^{M} \theta_m^q L_{t-m})}{1 + \exp(\theta_0^q + \sum_{m=1}^{M} \theta_m^q L_{t-m})} \qquad (9)$$

Assume that the two states correspond respectively to a lower financial stress (state 0) and a higher financial stress (state 1). Then, we might have the following situations:

1. $\sum_{m=1}^{M} \theta_m^p L_{t-m}$ and $\sum_{m=1}^{M} \theta_m^q L_{t-m}$:
   The currency and/or banking crisis is not informative about a forthcoming lower or higher financial stress. The model is a Hamilton (1991) model (if $(L_t) \neq 0$ and/or $q(L_t) \neq 0$) in the sense that the FSI index evolves in two regimes, but there are other variables explaining this. In the case $p(L_t) = q(L_t) = 0$, the dynamics of the FSI index is governed by a linear AR model and is not regime-dependent.
2. $\sum_{m=1}^{M} \theta_m^p L_{t-m} > 0$ (< 0):
   A positive change in the leading indicator increases (resp. reduces) the likelihood of a low financial stress regime m quarters later.
3. $\sum_{m=1}^{M} \theta_m^q L_{t-m} > 0$ (< 0):
   A positive change in the leading indicator increases (resp. reduces) the likelihood of a high financial stress regime m quarters later.
4. $\sum_{m=1}^{M} \theta_m^p L_{t-m} = 0$ and $\sum_{m=1}^{M} \theta_m^q L_{t-m} > 0$:
   The leading indicator is uninformative regarding the transition dynamics during the shifting from a low financial stress regime to a high financial stress regime. A positive shift in the leading indicator helps predicting whether there is an increased or reduced likelihood of observing a high financial stress regime m periods later only when the economy is already in a financial stress regime.
5. Symmetrical situation of case 4 when $\sum_{m=1}^{M} \theta_m^p L_{t-m} > 0$ (< 0) and $\sum_{m=1}^{M} \theta_m^q L_{t-m} = 0$: One can predict the likelihood of a lower stress regime only if the economy is already in that regime.

The last two cases illustrate situations in which it may be impossible (using the information contained in the financial variable) to say whether one can expect escape from a financial stress situation or go back to a low financial stress situation. Hence, the transition probability matrix can be presented also as follows:

The parameters of equations (7) through (9) are estimated jointly using a maximum likelihood (ML) estimator for mixtures of Gaussian distributions. As shown by Kiefer (1978), if the errors are normally distributed, then the ML yields consistent and asymptotically efficient estimates. Further, the inverse of the matrix of second partial derivatives of the likelihood function computed at the true parameter values is a consistent estimate of the asymptotic variance-covariance matrix of the parameter values.

As illustrated below, the results show that the North Africa countries and Turkey were influenced by the negative effects of the crisis from the advanced economies (mainly USA and Europe) more quickly than the GCC countries.

Once again, the GCC countries confirm their position as oil exporters with large financial capacity and relatively small populations. This group was in the best position to absorb the economic shocks. They entered the crisis in exceptionally strong position. This gave them a significant cushion against the initial impact of the global financial crisis. Although their stock markets were hard hit in the second half of 2008, their governments were able to respond by relaxing monetary policy, by providing capital, and guaranteeing deposits in national financial institutions.

Regarding North African countries and Turkey, their economies are diversified with strong trade and tourism linkages with Europe and OECD. This group of countries felt the impact of the crisis on their real economy as early as the last quarter of 2008, as recession spread across Europe and other export markets (Figure 11). For this reason, the impact of the crisis was immediate in comparison with GCC countries.

$$P(s_t = i / s_{t-1} = j, L_t) = \begin{bmatrix} p(L_t) = \dfrac{\exp\left(\theta_0^p + \sum_{m=1}^{M} \theta_m^p L_{t-m}\right)}{1 + \exp\left(\theta_0^p + \sum_{m=1}^{M} \theta_m^p L_{t-m}\right)} & 1 - p(L_t) = 1 - \dfrac{\exp\left(\theta_0^p + \sum_{m=1}^{M} \theta_m^p L_{t-m}\right)}{1 + \exp\left(\theta_0^p + \sum_{m=1}^{M} \theta_m^p L_{t-m}\right)} \\ 1 - q(L_t) = 1 - \dfrac{\exp\left(\theta_0^q + \sum_{m=1}^{M} \theta_m^q L_{t-m}\right)}{1 + \exp\left(\theta_0^q + \sum_{m=1}^{M} \theta_m^q L_{t-m}\right)} & q(L_t) = \dfrac{\exp\left(\theta_0^q + \sum_{m=1}^{M} \theta_m^q L_{t-m}\right)}{1 + \exp\left(\theta_0^q + \sum_{m=1}^{M} \theta_m^q L_{t-m}\right)} \end{bmatrix}$$

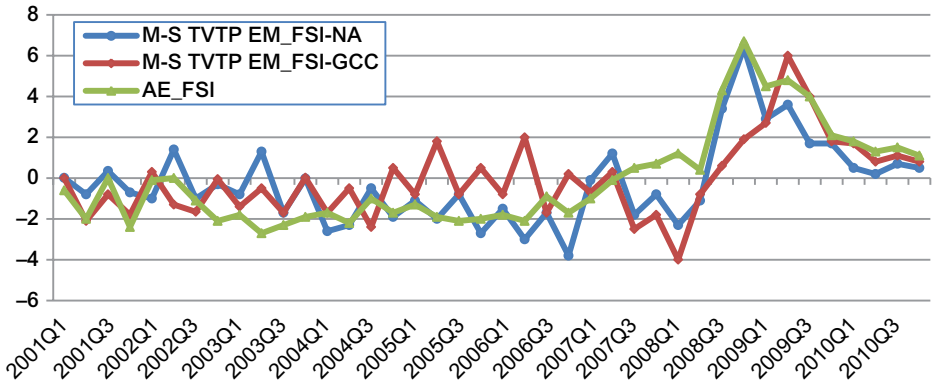

Figure 11. Markov-Switching time varying transition probability for EM_FSI to NA_FSI and GCC_FSI.

Table 4. Financial stress index decomposition.

	NA countries and Turkey					GCC countries				
	FSI CB cont	**FSI IB cont**	**FSI_Global**	**FSI% CB**	**FSI% IB**	**FSI CB cont**	**FSI IB cont**	**FSI_Global**	**FSI% CB**	**FSI% IB**
2001Q1	0,24	0,36	**0,6**	40,00%	60,00%	0,15	0,05	**0,2**	75,00%	25,00%
2001Q2	0,14	0,13	**0,27**	51,85%	48,15%	–0,52	–0,28	**–0,8**	65,00%	35,00%
2001Q3	0,3	0,38	**0,68**	44,12%	55,88%	–0,41	–0,34	**–0,75**	54,67%	45,33%
2001Q4	0,0045	0,0055	**0,01**	45,00%	55,00%	–0,2	–0,1	**–0,3**	66,67%	33,33%
2002Q1	0,023	0,037	**0,06**	38,33%	61,67%	–0,4	–0,5	**–0,9**	44,44%	55,56%
2002Q2	0,125	0,125	**0,25**	50,00%	50,00%	–0,8	–0,6	**–1,4**	57,14%	42,86%
2002Q3	0,42	0,63	**1,05**	40,00%	60,00%	–0,21	–0,24	**–0,45**	46,67%	53,33%
2002Q4	–0,01	–0,016	**–0,026**	38,46%	61,54%	–0,078	–0,072	**–0,15**	52,00%	48,00%
2003Q1	0,027	0,073	**0,1**	27,00%	73,00%	–0,27	–0,23	**–0,5**	54,00%	46,00%
2003Q2	–0,78	–0,62	**–1,4**	55,71%	44,29%	–0,31	–0,44	**–0,75**	41,33%	58,67%
2003Q3	–0,32	–0,73	**–1,05**	30,48%	69,52%	–0,5	–0,3	**–0,8**	62,50%	37,50%
2003Q4	–0,57	–0,23	**–0,8**	71,25%	28,75%	–0,41	–0,24	**–0,65**	63,08%	36,92%
2004Q1	–0,47	–0,38	**–0,85**	55,29%	44,71%	–0,7	–0,3	**–1**	70,00%	30,00%
2004Q2	–0,58	–0,35	**–0,93**	62,37%	37,63%	–0,2	–0,15	**–0,35**	57,14%	42,86%
2004Q3	–0,38	–0,62	**–1**	38,00%	62,00%	–0,45	–0,25	**–0,7**	64,29%	35,71%
2004Q4	–0,21	–0,89	**–1,1**	19,09%	80,91%	–0,9	–0,5	**–1,4**	64,29%	35,71%
2005Q1	–0,9	–0,7	**–1,6**	56,25%	43,75%	–1	–0,95	**–1,95**	51,28%	48,72%
2005Q2	–1	–0,85	**–1,85**	54,05%	45,95%	–0,31	–0,19	**–0,5**	62,00%	38,00%
2005Q3	–0,45	–0,45	**–0,9**	50,00%	50,00%	0,29	0,11	**0,4**	72,50%	27,50%
2005Q4	–0,65	–0,65	**–1,3**	50,00%	50,00%	0,12	0,08	**0,2**	60,00%	40,00%
2006Q1	–0,028	–0,022	**–0,05**	56,00%	44,00%	0,11	0,14	**0,25**	44,00%	56,00%
2006Q2	–0,6	–0,3	**–0,9**	66,67%	33,33%	0,45	0,35	**0,8**	56,25%	43,75%
2006Q3	–0,32	–0,43	**–0,75**	42,67%	57,33%	–0,18	–0,12	**–0,3**	60,00%	40,00%
2006Q4	–0,41	–0,29	**–0,7**	58,57%	41,43%	0,35	0,35	**0,7**	50,00%	50,00%
2007Q1	–0,95	–0,41	**–1,36**	69,85%	30,15%	–0,33	–0,07	**–0,4**	82,50%	17,50%
2007Q2	–0,45	–0,2	**–0,65**	69,23%	30,77%	–0,14	–0,06	**–0,2**	70,00%	30,00%
2007Q3	–0,3	–0,37	**–0,67**	44,78%	55,22%	–0,78	–0,47	**–1,25**	62,40%	37,60%
2007Q4	–0,3	–0,25	**–0,55**	54,55%	45,45%	–0,9	–0,37	**–1,27**	70,87%	29,13%
2008Q1	0,04	0,03	**0,07**	57,14%	42,86%	0,6	0,25	**0,85**	70,59%	29,41%
2008Q2	0,4	0,28	**0,68**	58,82%	41,18%	0,2	0,15	**0,35**	57,14%	42,86%
2008Q3	2	1,8	**3,8**	52,63%	47,37%	1,8	0,6	**2,4**	75,00%	25,00%
2008Q4	2,5	2,3	**4,8**	52,08%	47,92%	3,5	2,2	**5,7**	61,40%	38,60%
2009Q1	1,5	1,75	**3,25**	46,15%	53,85%	2	1,4	**3,4**	58,82%	41,18%
2009Q2	0,8	0,9	**1,7**	47,06%	52,94%	2	1	**3**	66,67%	33,33%
2009Q3	1	0,8	**1,8**	55,56%	44,44%	1,32	1,18	**2,5**	52,80%	47,20%
2009Q4	1	0,4	**1,4**	71,43%	28,57%	1,3	0,9	**2,2**	59,09%	40,91%
2010Q1	0,6	0,5	**1,1**	54,55%	45,45%	0,9	0,8	**1,7**	52,94%	47,06%
2010Q2	0,78	0,62	**1,4**	55,71%	44,29%	1,1	0,7	**1,8**	61,11%	38,89%
2010Q3	0,4	0,5	**0,9**	44,44%	55,56%	0,8	0,4	**1,2**	66,67%	33,33%
2010Q4	0,35	0,35	**0,7**	50,00%	50,00%	0,3	0,2	**0,5**	60,00%	40,00%

CB cont: Conventionnal banks contribution, **IB cont:** Islamic banks contribution

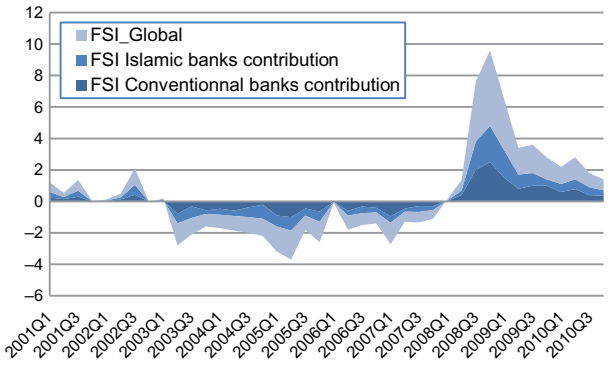

Figure 12. FSI decomposition for NA-TU countries.

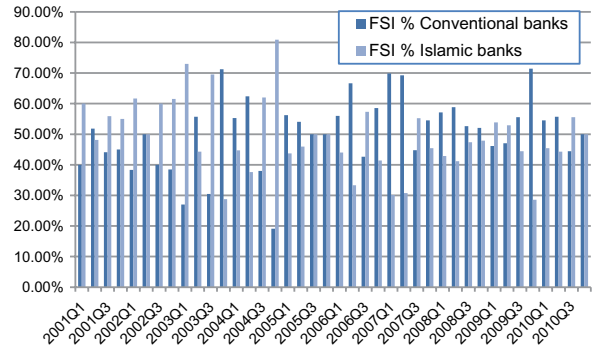

Figure 13. FSI decomposition for NA-TU countries.

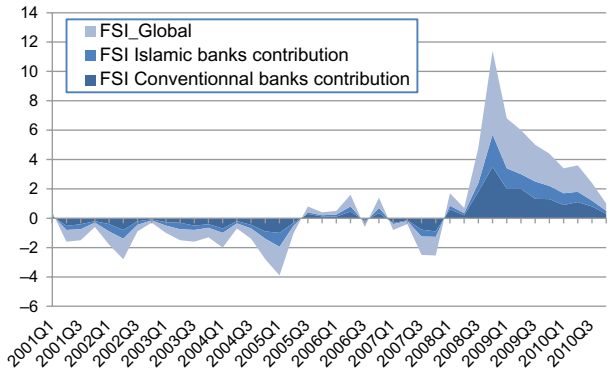

Figure 14. FSI decomposition for GCC countries.

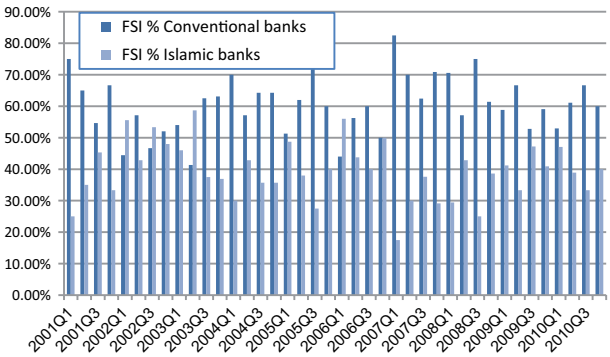

Figure 15. FSI decomposition for GCC countries.

8. Financial stress index decomposition

Table 4 summarizes the estimated decomposition of financial stress derived from the estimated time-varying transition probability with Markov-switching model, comparing the contribution of conventional banks and Islamic banks. The table shows that financial stress in NA countries and Turkey is on the whole fairly divided between conventional banks and Islamic banks and that the situation does not deeply differ for the GCC countries. This means that the Islamic banks are not more competitive against conventional banks in the crises situations. Most of financial stress episodes have a negative effect on both conventional and Islamic banks in critical distress warning signal mainly due to increased financial stress in advanced economies countries.

9. Results discussion

The previous sections have shown that only about third of the episodes of financial stress identified in this paper were followed by economic slowdown. So, we could say that not all financial stress episodes are going to be followed by economic downturns, only the most episodes with high FSI can lead to severe and prolonged downturns.

Banking-related financial stress and economic downturns

An analysis of the episodes suggests that banking system stress tends to be associated with larger output consequences than episodes of pure securities or foreign exchange market stresses, where the banking system remains largely unaffected. Around 75 percent of the episodes of financial stress are banking-related. Moreover all severe economic downturns are preceded by a high banking-related financial stress episodes compared with other types of financial stress episodes. In fact, the difference between banking-related and non-banking-related episodes is significant. Consequently, downturns preceded by banking related stress tend to last longer and are associated with larger average GDP losses than those preceded by different types of financial stress, or indeed no financial stress at all.

Why Islamic banks seem to be vulnerable in some crisis situations identical to conventional banks according to the obtained results?

Islamic hedging products, derivatives, liquidity and risk-management tools are all in their early stages of development. Derivatives are viewed positively given their application to risk mitigation. Moreover, practitioners and

scholars are becoming increasingly open to more aggressive hedging structures.

The last financial crisis has hit banks worldwide, and has driven the industry to diversify their strategies to include key segments such as Islamic bonds, or Sukuk. Sukuk issuance in 2008 dropped 60% from 2007 due to debates over the Shariah-compliance of some types of Sukuk.

Several smaller Islamic financial institutions have reported losses as early as the fourth quarter of 2008. There were a number of reasons for these losses. For one, many banks suffered liquidity shortages, especially Islamic investment banks, which were highly dependent on funding from other banks rather than customer deposits. Moreover, the quality of the financing and investment portfolios declined, leading to write-downs and increased loan provisions.

Since the global financial crisis primarily originated from the sub-prime mortgage portfolio which was spun off into securitized instruments subsequently offered as investments, an immediate assessment of the impact of the crisis on Islamic banks was that they were not affected because Islamic finance is based on and reinforces a close link between financial and productive flows. However, the protracted duration of the crisis have started to impact the functioning of Islamic banks under some financial conditions. Yet despite their strong showing, some analysts warn that Islamic banking, like so many of the financial vehicles that enjoyed soaring popularity over the past decade, is attracting investors with false impressions of lower risk.

With a downturn in the economy in most advanced countries, and an impending global recession, property markets have seen a decline in a number of countries where Islamic financial institutions constitute a significant presence. This carries negative implications for these institutions as a large number of Islamic finance contracts are backed by real estate and property as collateral.

Notwithstanding, the region is expected to suffer less than the more advanced economies in which recession has already set in. The outlook for Islamic finance remains strong, given that, in the face of the turmoil, most conventional financial institutions are also in the process of establishing Islamic windows and Shariah-compliant products to protect their loan portfolio.

10. Conclusions and policy implications

This paper introduces a Financial Stress Index for the MENA region and analyzes how financial stress is framed by both currency crises and banking crises. Furthermore, the FSI offers a wide range of possibilities to separate the impact of banking crises from conventional banks and banking crises from Islamic banks.

Also, the analysis explains some spillover effects and reveals that crises are transmitted mainly from advanced economies to emerging economies. In line with this pattern, the unprecedented spike in financial stress in advanced economies in the third quarter of 2008 had a major effect on emerging economies.

Using the FSI, this paper has empirically investigated a currency-banking crisis and the economic downturns in some MENA countries. Results indicate that the majority of increased financial stress in these countries is attributable to the banking crisis. In addition, results show that the considered North Africa countries and Turkey were less robust and more influenced in comparison with GCC countries in episodes of financial stress and downturns in economic activity in advanced economies.

Estimates of the FSI index are useful in that they can help policymakers determine corrective countercyclical policy measures required for maintaining macroeconomic stability and sustaining economic activity.

Contrary to North Africa countries, the moderate impact of the global financial crisis on the GCC banking sectors has generally demonstrated the soundness of these systems. Notwithstanding the general soundness of GCC banks, our analysis indicates some weaknesses associated with the operational aspects of GCC banks and the characteristics of the GCC economies. These would need to be evaluated and addressed by GCC policy makers.

Notes

1. Turkey is introduced with North African countries in order to supply the sample data with more crises events (mainly 2000–2001 Turkish currency crisis).
2. http://www.bloomberg.com/
3. The capital asset pricing model (CAPM) is used to determine a theoretically appropriate required rate of return of an asset, if that asset is to be added to an already well-diversified portfolio, given that asset's non-diversifiable risk. The model takes into account the asset's sensitivity to non-diversifiable risk (also known as systematic risk or market risk), often represented by the quantity beta (β) in the financial industry, as well as the expected return of the market and the expected return of a theoretical risk-free asset.
4. Where $\nabla = (1 - B)$ is the standard differencing operator and B is the standard backshift (lag) operator, such that $B^{j}_{x_t} = x_{t-j}$, and $\nabla_{x_t} = x_t - x_{t-1}$. Also define the forward shifting operators: $F = B^{-1}$ and $\Delta = (1 - F)$.

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